

FCC MAIL SECTION

Federal Communications Commission

FCC 00-17

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Before the  
**FEDERAL COMMUNICATIONS COMMISSION**  
 DISPATCH BY Washington, D.C. 20554

In the Matter of )  
 )  
 Establishment of an Improved Model for )  
 Predicting the Broadcast Television Field ) ET Docket No. 00-11  
 Strength Received at Individual Locations )

**NOTICE OF PROPOSED RULEMAKING**

Adopted: January 13, 2000;

Released: January 20, 2000

**Comment Date:** February 22, 2000**Reply Comment Date:** March 7, 2000

By the Commission:

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## I. INTRODUCTION

1. By this action, we propose rules prescribing a point-to-point predictive model for determining the ability of individual locations to receive an over-the-air television broadcast signal of a specific intensity through the use of a conventional, stationary, outdoor rooftop receiving antenna. Our goal in developing this model is to provide a means for reliably and presumptively determining whether the over-the-air signals of network affiliated television stations can be received at individual locations. Such determinations are used in establishing the eligibility of individual households to receive the signals of television broadcast network stations by satellite carriers. In issuing this proposal, we are complying with new statutory requirements set forth in the Satellite Home Viewer Improvement Act of 1999 (SHVIA).<sup>1</sup> The signal intensity for determining eligibility is the Grade B standard<sup>2</sup> set forth in §73.683(a) of the Commission's rules (47 CFR, Part 73).

## II. BACKGROUND

2. The SHVIA revises and extends statutory provisions established by Congress in the 1988 Satellite Home Viewer Act (SHVA).<sup>3</sup> With regard to prediction of signal availability, the SHVIA adds a new section 339(c)(3) to the Communications Act of 1934, as amended (47 U.S.C.), which requires that "[W]ithin 180 days after the date of enactment of the Satellite Home Viewer Improvement Act of 1999, the Commission shall take all actions necessary, including any reconsideration, to develop and prescribe by rule a point-to-point predictive model for reliably and presumptively determining the ability of individual locations to receive signals in accordance with the signal intensity standard in effect under section 119(d)(10)(A) of title 17, United States Code."<sup>4</sup> Section 339(c)(3) further provides that "[I]n prescribing such a model, the Commission shall rely on the Individual Location Longley-Rice model set forth by the Federal Communications Commission in Docket No. 98-201, and ensure that such model takes into account terrain, building structures, and other land cover variations. The Commission shall

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<sup>1</sup> See Satellite Home Viewer Improvement Act of 1999 ("SHVIA"), Title I of the Intellectual Property and Communications Omnibus Reform Act of 1999 ("IPACORA"), PL 106-113, 113 Stat. 1501, Appendix I (1999) relating to copyright licensing and carriage of broadcast signals by satellite carriers, codified in scattered sections of 17 and 47 U.S.C.).

<sup>2</sup> The SHVIA also directs the Commission to evaluate all possible standards and factors for determining eligibility for retransmission of signals of network stations to determine whether it may be appropriate to recommend, in a report to Congress, modifications to the Grade B intensity standard set forth in §73.683(a) of the Commission's rules (47 CFR, Part 73) for the purpose of determining eligibility.

<sup>3</sup> See 1988 Satellite Home Viewer Act, 17 U.S.C. §119 (1988). Congress enacted the SHVA as an amendment to the Copyright Act in order to protect television broadcasters' copyright interests while simultaneously enabling satellite carriers to provide the signals of broadcast network stations to those satellite subscribers who are unable to obtain local network stations over-the-air. Congress considered these subscribers to be "unserved" by their local stations.

<sup>4</sup> See SHVIA, section 1008.

establish procedures for the continued refinement in the application of the model by the use of additional data as it becomes available.” The SHVIA also requires that the courts rely on the Individual Location Longley Rice model established by the Commission for making presumptive determinations of whether a household is capable of receiving broadcast television signals of Grade B intensity.<sup>5</sup>

3. In its *Report and Order* in CS Docket No. 98-201 (*SHVA Report and Order*)<sup>6</sup>, the Commission endorsed the use of a specific model for predicting signal strength at individual locations. This model, which the Commission termed “Individual Location Longley-Rice” or “ILLR,” is a version of Longley-Rice 1.2.2<sup>7</sup>. The Commission recommended that the ILLR model be used for determining a presumption of service or lack of service by local over-the-air television signals at individual locations for purposes of establishing a household’s eligibility to receive network television programming by satellite carriers under the SHVA.

4. Based on the record in the SHVA proceeding, the Commission found that vegetation and buildings affect signal intensity at individual locations. However, it also found that at the time of the *SHVA Report and Order*, there was no standard means of including such information in the ILLR that had been accepted by the technical and scientific community. The Commission therefore stated that land use and cover information will be included in the ILLR when an appropriate method for using such information in the context of determining the field strength of broadcast television signals at individual locations has been developed and accepted. The Commission reiterated this conclusion in the Order on Reconsideration, FCC 99-278. In this most recent Order, the Commission denied DirecTV’s petition for reconsideration, in part, on the basis that it failed to provide the information and details necessary to evaluate an application to consider land use and cover in the ILLR.<sup>8</sup>

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<sup>5</sup> See SHVIA, section 1005. Section 1005 of the SHVIA amends section 119(a)(2)(B) of title 17 of the United States Code (Copyrights) to require that “[I]n determining presumptively whether a person resides in an unserved household ... a court shall rely on the Individual Location Longley-Rice model set forth by the Federal Communications Commission in Docket No. 98-201, as that model may be amended by the Commission over time under section 339(c)(3) of the Communications Act of 1934 to increase the accuracy of that model.”

<sup>6</sup> *Satellite Delivery of Network Signals to Unserved Households for Purposes of the Satellite Home Viewer Act; Part 73 Definition and Measurement of Signals of Grade B Intensity*, adopted February 1, 1999, 14 FCC Rcd 2654 (1999).

<sup>7</sup> The Longley-Rice radio propagation model is used to make predictions of radio field strength at specific geographic points based on the elevation profile of terrain between the transmitter and each specific reception point. A computer is needed to make these predictions because of the large number of reception points that must be individually examined. Computer code for the Longley-Rice point-to-point radio propagation model is published in an appendix of NTIA Report 82-100, *A Guide to the Use of the ITS Irregular Terrain Model in the Area Prediction Mode*, authors G.A. Hufford, A.G. Longley and W.A. Kissick, U.S. Department of Commerce, April 1982. Some modifications to the code were described by G.A. Hufford in a memorandum to users of the model dated January 30, 1985. With these modifications, the code is referred to as Version 1.2.2 of the Longley-Rice model.

<sup>8</sup> See *Order on Reconsideration* FCC 99-278 (CS Docket No. 98-201, released October 7, 1999) at ¶ 8.

5. Subsequent to the *SHVA Report and Order*, the ILLR has been implemented by several commercial companies as a tool for determining whether particular households, identified by street address, are served or unserved for purposes of the SHVA. Providers of programming service by satellite carriers are screening potential customers for eligibility at the point-of-sale using the ILLR model.

### III. DISCUSSION

6. Following the direction of Congress in the SHVIA, we are proposing to define an improved model for predicting the field strength produced by a television network affiliate broadcasting station at individual locations, using as a guide the ILLR model as described in the *SHVA Report and Order*. This model would be incorporated into our rules as the required method for making presumptive determinations of individual household's eligibility for satellite retransmission of distant network signals. The prediction model we are proposing takes into account terrain, building structures, and other land cover variations, some of which are yet to be evaluated and accepted by the scientific and technical community. We therefore are also outlining a process through which values can be developed for these parameters. This process provides for continued refinement of the model on the basis of reliable technical evidence, as it becomes available.

#### A. The Current ILLR Prediction Model

7. The current ILLR model is the version of Longley-Rice 1.2.2 that we endorsed in the *SHVA Report and Order*. It is similar to the point-to-point predictive model we established for digital television (DTV) coverage and interference prediction. The ILLR model does not replace the current Commission rules for field strength contours (47 CFR §73.683) or prediction of coverage for non-SHVA purposes (47 CFR §73.684). In fact, the ILLR model may identify unserved households lying within a station's Grade B contour and may, likewise, identify served households outside a Grade B contour.

8. In Appendix A, we specify the technical details that are to be used with Longley-Rice 1.2.2 to qualify the latter as the ILLR model required under the SHVIA. The *SHVA Report and Order* left some of these details to choice since it offered ILLR only as a means to make administration of the unserved household rule under SHVA easier and more cost-effective. Here, some of the Longley-Rice 1.2.2 input parameters have values different from those utilized for application of the model to DTV.<sup>9</sup>

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<sup>9</sup> The Longley-Rice model used for analysis of DTV and analog TV service in the DTV proceeding is described in "Longley-Rice Methodology for Evaluating TV Coverage and Interference," OET Bulletin 69, Federal Communications Commission (July 2, 1997) < <http://www.fcc.gov/oet/info/documents/bulletins/#69> >. Longley-Rice is the Commission's designated methodology for determining where service is provided by a DTV station. See 47 C.F.R. 73.622(e). See also *Advanced Television Systems: Sixth Report and Order* ("DTV Sixth Report and Order"), 12 FCC Rcd 14588, 14672-76.

## B. Improvements in the Model

9. In this rule making, we propose to improve the ILLR model by adding clutter loss parameters. The clutter loss includes the effects of both vegetation and buildings and is dependent upon the environment of the individual household reception point. Reception point environments are to be classified in terms of the codes used in the Land Use and Land Cover (LULC) database of the United States Geological Survey, and clutter loss values are to be added to the radio propagation loss predicted by basic Longley-Rice 1.2.2. Based on the record in CS Docket No. 98-201, we believe the LULC database is highly appropriate for incorporating land use and clutter in ILLR. The LULC database is publicly available in a form suitable for use in conjunction with computer programs at the point-of-sale of satellite programming services.<sup>10</sup>

10. To simplify use of the database for ILLR purposes, we have reorganized the LULC categories in a way specifically relevant to radio propagation. After regrouping, we identify 10 environmental classes, almost all of which are combinations of several of the original LULC categories. Since many of the original LULC categories distinguish between environments in ways that are unimportant for propagation prediction, it is clear that simplification is in order. The particular simplification we are proposing for the ILLR is defined in Appendix A along with other details of the ILLR model. This simplification is the same as a classification system currently under consideration by an industry standardization committee.<sup>11</sup>

11. In the improved ILLR model, it is contemplated that a clutter loss value (a reduction in available signal intensity) will be associated with each and every LULC classification in a way that is also dependent upon frequency. However, the available data for assigning values to these parameters is limited, and we believe it is reasonable to assign values only in situations for which measurement data have been analyzed and published, or for which we have some confidence in deriving such values. We are basing the ILLR table of clutter loss on the results published in a recent engineering journal by Thomas N. Rubinstein.<sup>12</sup> Since the Rubinstein values of clutter loss are derived exclusively from measurements made at receiver sites with Fresnel clearance, the values should apply only to matching situations.<sup>13</sup> For other situations, the clutter loss will have to remain equal to the default value of zero dB, the value it effectively has in the current ILLR model where LULC data is not used. We recognize that, under this approach, the number of situations in which clutter loss may be taken into account will be limited. We therefore request comment on whether other data are available that would allow us to expand the application of clutter loss considerations, and whether there are other approaches that are

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<sup>10</sup> See USGS web page at <[http://edcwww.cr.usgs.gov/glis/hyper/guide/1\\_250\\_lulc](http://edcwww.cr.usgs.gov/glis/hyper/guide/1_250_lulc)>.

<sup>11</sup> Working Group TR8.18 of the Telecommunications Industry Association (TIA) is preparing a document to be published as Technical Standards Bulletin TSB-88.

<sup>12</sup> Thomas N. Rubinstein, "Clutter Losses and Environmental Noise Characteristics Associated with Various LULC Categories," *IEEE Transactions on Broadcasting*, Vol. 44, No. 3, September 1998.

<sup>13</sup> Fresnel clearance is a geometrical property of the radio path from transmitter to individual receiving location. The receiver is considered to be in a shadowed location if a terrain elevation point along the path extends 0.6 of the way into the first Fresnel zone.

scientifically supported and could be integrated into the ILLR model to take into account losses due to vegetation and man-made structures.

12. It is particularly problematic that the Rubinstein table of losses does not cover low band VHF television, channels 2 through 5, so that no clutter loss can be assigned to reception on these channels without introducing an exception to our principle of not assigning values unless measurement data have been analyzed and published for matching situations. We are proposing to address this problem by using clutter loss values for low band channels that are derived by applying frequency trend data to the Rubinstein clutter loss values for high band VHF. The frequency trend we have applied is that found by Okumura.<sup>14</sup> The low band values obtained in this way are tabulated in Appendix A. Comments are requested on the acceptability of this approach.

#### C. Procedures for Continued Refinement

13. Because of copyright law implications addressed by the SHVIA, we believe that formal rule making is appropriate to make changes in the future in the ILLR model that we adopt in this proceeding. We will initiate such future actions upon the filing of a petition for rule making that is supported by high quality engineering studies containing conclusions based on reliable and publicly available measurement data. We anticipate that LandSat data and industry efforts like those currently underway under the auspices of the Telecommunications Industry Association will contribute to future improvements to the ILLR.<sup>15</sup> We seek comment on this proposed procedure and any other suggestions for revising the ILLR in a timely fashion.

#### D. Designation of Neutral and Independent Entity for Signal Tests Purposes

14. In addition to requiring that the Commission conduct a rule making to improve the ILLR predictive model, Section 339 prescribes procedures for selecting a qualified, independent person to test the signal at a household. In particular, Section 339(c)(4)(B) provides:

If the satellite carrier and the network station or stations asserting that the retransmission [of a signal of a distant network station] is prohibited are unable to agree on such a person to conduct the test, the person shall be designated by an independent and neutral entity designated by the Commission by rule.

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<sup>14</sup> Okumura, Yoshihisa *et al*, "Field Strength and its Variability in VHF and UHF Land Mobile Radio Service," *Rev. Electrical Comm Lab*, Vol. 16, Sept-Oct 1968, pp 825-873.

<sup>15</sup> The latest member of the Landsat family of earth satellites, Landsat 7, was launched into orbit on April 15, 1999. Landsat satellites, a NASA program, gather remotely sensed images of the land surface and surrounding coastal regions for global change research, regional environmental change studies and other civil and commercial purposes. Previous Landsat missions provided the information incorporated in the USGS LULC database. After data reduction, Landsat 7 will provide data of greater significance for radio propagation prediction. Industrial and governmental organizations in Canada are already deriving radio propagation prediction databases from the latest LandSat images.

15. As part of this NPRM, we seek comment on how to identify qualified entities as candidates to fulfill this legislative requirement. What types of qualifications should such an entity possess? Are there industry testing labs in existence that could fill this role? What characteristics will demonstrate the independence and neutrality contemplated by the statute? Should there be multiple designating entities across the country or one central clearinghouse?

16. We recognize the importance of completing the proceeding to determine the designated tester as quickly as possible and, therefore, include this issue in this expedited proceeding to revise the ILLR.

#### IV. PROCEDURAL MATTERS

17. Paperwork Reduction Act of 1995 Analysis. The requirements proposed in this Notice have been analyzed with respect to the Paperwork Reduction Act of 1995 (the "1995 Act") and would impose no new or modified information collection requirements on the public.

18. Initial Regulatory Flexibility Certification. The Regulatory Flexibility Act of 1980, as amended (RFA)<sup>16</sup> requires that an initial regulatory flexibility analysis be prepared for notice-and-comment rulemaking proceedings, unless the agency certifies that "the rule will not, if promulgated, have a significant economic impact on a substantial number of small entities."<sup>17</sup> The RFA generally defines "small entity" as having the same meaning as the terms "small business," "small organization," and "small governmental jurisdiction."<sup>18</sup> In addition, the term "small business" has the same meaning as the term "small business concern" under the Small Business Act.<sup>19</sup> A small business concern is one which: (1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the Small Business Administration (SBA).<sup>20</sup>

19. In this Notice of Proposed Rulemaking, the Commission proposes to prescribe a prediction technique for determining the ability of individual households to receive television signals broadcast over-the-air by local stations. The proposals apply exclusively to the sources of data for certain engineering calculations and to the manner in which these calculations are

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<sup>16</sup> The RFA, *see* 5 U.S.C. S 601 *et. seq.*, has been amended by the Contract With America Advancement Act of 1996, Pub. L. No. 104-121, 110 Stat. 847 (1996) (CWAAA). Title II of the CWAAA is the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA).

<sup>17</sup> 5 U.S.C. § 605(b).

<sup>18</sup> 5 U.S.C. § 601(6).

<sup>19</sup> 5 U.S.C. § 601(3) (incorporating by reference the definition of "small business concern" in Small Business Act, 15 U.S.C. S § 632). Pursuant to 5 U.S.C. § 601(3), the statutory definition of a small business applies "unless an agency, after consultation with the Office of Advocacy of the Small Business Administration and after opportunity for public comment, establishes one or more definitions of such term which are appropriate to the activities of the agency and publishes such definition(s) in the Federal Register."

<sup>20</sup> Small Business Act, § 15 U.S.C. S 632.

made. Television station licensees, Direct Broadcast Satellite (DBS) operators, and other Direct to Home (DTH) Satellite operators may use the proposed technique to establish the eligibility or non-eligibility of individual households for satellite delivery of local television programming. These determinations will usually be made at the point of sale of satellite receiving equipment for homes and will tend to increase the number of eligible customers. The changes we propose are of a purely electrical engineering, scientific nature, without a substantial economic impact. In addition, the primary economic impact of these proposals will be their indirect effect on individual consumers. Therefore, we certify that the proposals in this Notice of Proposed Rulemaking, if adopted, will not have a significant economic impact on a substantial number of small entities. If commenters believe that the proposals discussed in the Notice require additional RFA analysis, they should include a discussion of these issues in their comments (see deadlines in paragraph 21, below), and additionally label them as RFA comments. The Commission will send a copy of this Notice of Proposed Rulemaking, including this initial certification, to the Chief Counsel for Advocacy of the Small Business Administration. A copy will also be published in the Federal Register. *See* 5 U.S.C. § 605(b).

20. Ex Parte Rules. This proceeding will be treated as a "permit-but-disclose" proceeding subject to the "permit-but-disclose" requirements under Section 1.1206(b) of the rules. 47 C.F.R. § 1.1206(b), as revised. Ex parte presentations are permissible if disclosed in accordance with Commission rules, except during the Sunshine Agenda period when presentations, ex parte or otherwise, are generally prohibited. Persons making oral ex parte presentations are reminded that a memorandum summarizing a presentation must contain a summary of the substance of the presentation and not merely a listing of the subjects discussed. More than a one or two sentence description of the views and arguments presented is generally required. *See* 47 C.F.R. § 1.1206(b)(2), as revised. Additional rules pertaining to oral and written presentations are set forth in Section 1.1206(b).

21. Filing of Comments and Reply Comments. Pursuant to Sections 1.415 and 1.419 of the Commission's rules, 47 C.F.R. §§ 1.415, 1.419, interested parties may file comments on or before February 22, 2000, and reply comments on or before March 7, 2000. Comments may be filed using the Commission's Electronic Comment Filing System (ECFS) or by filing paper copies. *See* Electronic Filing of Documents in Rulemaking Proceedings, 63 FR 24,121 (1998).

22. Comments filed through the ECFS can be sent as an electronic file via the Internet to <<http://www.fcc.gov/e-file/ecfs.html>>. Generally, only one copy of an electronic submission must be filed. If multiple docket or rulemaking numbers appear in the caption of this proceeding, however, commenters must transmit one electronic copy of the comments to each docket or rulemaking number referenced in the caption. In completing the transmittal screen, commenters should include their full name, Postal Service mailing address, and the applicable docket or rulemaking number. Parties may also submit an electronic comment by Internet e-mail. To get filing instructions for e-mail comments, commenters should send an e-mail to [ecfs@fcc.gov](mailto:ecfs@fcc.gov), and should include the following words in the body of the message, "get form <your e-mail address>." A sample form and directions will be sent in reply.

23. Parties who choose to file by paper must file an original and four copies of each filing. If more than one docket or rulemaking number appear in the caption of this proceeding,



commenters must submit two additional copies for each additional docket or rulemaking number. All filings must be sent to the Commission's Secretary, Magalie Roman Salas, Office of the Secretary, Federal Communications Commission, 445 12th Street, S.W., Washington, D.C. 20554. The Office of Engineering and Technology contact for this proceeding is Robert Eckert at 202-418-2433, or at [reckert@fcc.gov](mailto:reckert@fcc.gov).

24. Parties who choose to file by paper should also submit their comments on diskette. These diskettes should be submitted to: Robert Eckert, 445 Twelfth Street, S.W., Washington, D.C. 20554. Such a submission should be on a 3.5 inch diskette formatted in an IBM compatible format using Office 97 Word or compatible software. The diskette should be accompanied by a cover letter and should be submitted in "read only" mode. The diskette should be clearly labeled with the commenter's name, proceeding (including the lead docket number in this case, type of pleading (comment or reply comment), date of submission, and the name of the electronic file on the diskette. The label should also include the following phrase "Disk Copy - Not an Original." Each diskette should contain only one party's pleadings, preferably in a single electronic file. In addition, commenters must send diskette copies to the Commission's copy contractor, International Transcription Service, Inc., 1231 20th Street, N.W., Washington, D.C. 20036.

## V. ORDERING CLAUSES

25. IT IS ORDERED that, pursuant to Sections 1, 4(i), 4(j) of the Communications Act of 1934, as amended, 47 U.S.C. §§ 151, 154(i), and 154(j); Section 1008 of the Intellectual Property and Communications Omnibus Reform Act of 1999, PL 106-113, 113 Stat. 1501, Appendix I; and Section 119(d)(10)(a) of the Copyright Act, 17 U.S.C. § 119(d)(10)(a), NOTICE IS HEREBY GIVEN of proposed amendments to Part 73, in accordance with the proposals, discussions and statements of issues in this *Notice of Proposed Rule Making*, and that COMMENT IS SOUGHT regarding such proposals, discussions and statements of issues.

26. IT IS FURTHER ORDERED that the Commission's Consumer Information Bureau, Reference Information Center, SHALL SEND a copy of this Notice of Proposed Rulemaking, including the Initial Regulatory Flexibility Certification, to the Chief Counsel for Advocacy of the Small Business Administration.

27. For additional information concerning this matter, contact Robert Eckert (202-418-2433), Harry Wong (202-418-2437), or Nam Pham (202-418-2438), Office of Engineering and Technology, Technical Research Branch.

## FEDERAL COMMUNICATIONS COMMISSION



Magalie Roman Salas  
Secretary

## APPENDIX A

### Technical Data

This appendix specifies technical details and input parameters that are to be used with Longley-Rice Version 1.2.2 to qualify the latter as the Individual Location Longley-Rice (ILLR) propagation prediction model per Section 73.683(d) of the FCC rules. The method for including Land Use and Land Clutter (LULC) classifications of locations with attributed clutter loss values is defined here. This appendix will be republished as OET Bulletin No. 70 and included in FCC rules by reference.

Computer code for the Longley-Rice radio propagation prediction model is published in an appendix of NTIA Report 82-100, *A Guide to the Use of the ITS Irregular Terrain Model in the Area Prediction Mode*, authors G.A. Hufford, A.G. Longley and W.A. Kissick, U.S. Department of Commerce, April 1982. The report may be obtained from the U.S. Department of Commerce, National Technical Information Service, Springfield, Virginia, by requesting Accession No. PB 82-217977. Some modifications to the code were described by G.A. Hufford in a memorandum to users of the model dated January 30, 1985. With these modifications, the code is referred to as Version 1.2.2 of the Longley-Rice model. It is available for downloading at the U.S. Department of Commerce Web site, <<http://elbert.its.bldrdoc.gov/itm.html>>.

When run under the conditions given in Table 1, the Longley-Rice model becomes the ILLR per Section 73.683(d) of the FCC rules. Note especially the following unique features of the ILLR prediction procedure (they distinguish the ILLR model from, for instance, the use of Longley-Rice for digital television coverage and interference calculations as detailed in OET Bulletin No. 60):

- The time variability factor is 50% presuming that the ILLR field strength prediction is to be compared with a required field (the Grade B field intensity defined in Section 73.683(d) of the FCC rules) that already includes an allowance for long term (daily and seasonal) time fading;
- the confidence variability factor is 50% indicating median situations;
- the model is run in individual mode;
- terrain elevation is considered every 1/10 of a kilometer;
- receiving antenna height is assumed to be 6 m (20 feet) above ground for one-story buildings and 9 m (30 feet) above ground for buildings taller than one-story;
- where error codes indicate a severe error, the field strength is deemed inadequate for TV service;
- land use and land cover (e.g., vegetation and buildings) considerations are included.

The field strength of a network TV station at an individual location is predicted as follows:

- 1) Find engineering data for the network affiliate station of interest by, for example, consulting the FCC Web site at <<http://www.fcc.gov/mmb/vsd/>>. Necessary data are station latitude and longitude, height above mean sea level of the radiation center, and the effective radiated power (ERP) in the direction of the individual location under study.
- 2) Run Longley-Rice 1.2.2 in the point-to-point mode with the parameters specified in Table 1 to find the propagation path loss relative to free space propagation.
- 3) Examine the path terrain profile and direct ray from the transmitter radiation center to the 6- or 9-meter receiving point to determine whether the ray clears by at least 0.6 of the radius of the first Fresnel zone. If not, the ILLR Clutter Loss is 0 dB and steps 4 and 5 should be omitted.
- 4) Find the USGS Land Use and Land Cover classification of the individual location under study by consulting the the LULC database, available from the USGS web page at <[http://edcwww.cr.usgs.gov/glis/hyper/guide/1\\_250\\_lulc](http://edcwww.cr.usgs.gov/glis/hyper/guide/1_250_lulc)>.
- 5) Convert the USGS Land Use and Land Cover classification to the corresponding ILLR category using Table 2, and find the associated clutter loss from Table 3.
- 6) Finally, calculate the ILLR field strength prediction from the formula

$$\text{Field} = (\text{Free Space Field}) - (\text{Longley-Rice 1.2.2 Path Loss}) - (\text{ILLR Clutter Loss})$$

where the Free Space Field in  $\text{dB}\mu = 106.92 + 10\log_{10}(\text{ERP}) - 20\log_{10}(\text{distance})$ , and distance is the path length in kilometers from transmitter to the individual location under study.

HG(1) in Table 1 is the height of the radiation center above ground. It is determined by subtracting the ground elevation above mean sea level (AMSL) at the transmitter location from the height of the radiation center AMSL. The latter may be found in the FCC's TV Engineering Data Base while the former is retrieved from the terrain elevation data base as a function of the transmitter site coordinates also found in the TV Engineering Data Base.

Terrain elevation data at uniformly spaced points the between transmitter and receiver must be provided. The ILLR computer program must be linked to a terrain elevation data base with values every 3 arc-seconds of latitude and longitude or closer. The program should retrieve elevations from this data base at regular intervals with a spacing increment of 0.1 kilometer (parameter XI in Table 1). The elevation of a point of interest is determined by linear interpolation of the values retrieved for the corners of the coordinate rectangle in which the point of interest lies.

**Table 1.**

**Parameter Values for ILLR Implementation of the Longley-Rice Fortran Code**

Parameter	Value	Meaning/Comment
EPS	15.0	Relative permittivity of ground.
SGM	0.005	Ground conductivity, Siemens per meter.
ZSYS	0.0	Coordinated with setting of EN0. See page 72 of NTIA Report.
EN0	301.0	Surface refractivity in N-units (parts per million).
IPOL	0	Denotes horizontal polarization.
MDVAR	1	Code 1 sets individual mode of variability calculations.
KLIM	5	Climate code 5 for continental temperate.
XI	0.1 m	Distance between successive points along the radial from transmitter to individual reception point.
HG(1)	see text	Height of the radiation center above ground.
HG(2)	6 m, or 9 m	Height of TV receiving antenna above ground. Use 6 m for one-story building; otherwise 9 m.
KWX	numeric error marker	KWX is an output indicating the severity of a possible error due to parameters being out of range. Accept the field strength prediction when KWX equals 0 or 1, otherwise (KWX = 2, 3, or 4) presume the field is inadequate for TV reception.
LULC Category	1 to 10	This parameter is added to Longley-Rice for ILLR purposes. See Tables 2 and 3.

**Table 2.****Regrouping of LULC Categories for ILLR Applications**

The United States Geological Survey (USGS) maintains a database on land use and land cover indicating features such as vegetation and man-made structures. It is often called the LULC database and is available from the USGS web page at <[http://edcwww.cr.usgs.gov/glis/hyper/guide/1\\_250\\_lulc](http://edcwww.cr.usgs.gov/glis/hyper/guide/1_250_lulc)>.

LULC Classification Number	LULC Classification Description	ILLR Clutter Category Number	ILLR Clutter Category Description
11	Residential	7	Residential
12	Commercial and services	9	Commercial/industrial
13	Industrial	9	Commercial/industrial
14	Transportation, communications, & utilities	1	Open land
15	Industrial and commercial complexes	9	Commercial/industrial
16	Mixed urban and built-up lands	8	Mixed urban/buildings
17	Other urban and built-up land	8	Mixed urban/buildings
21	Cropland and pasture	2	Agricultural
22	Orchards, groves, vineyards, nurseries, and horticultural	2	Agricultural
23	Confined feeding operations	2	Agricultural
24	Other agricultural land	2	Agricultural
31	Herbaceous rangeland	3	Rangeland
32	Shrub and brush rangeland	3	Rangeland
33	Mixed rangeland	3	Rangeland
41	Deciduous forest land	5	Forest land
42	Evergreen forest land	5	Forest land
43	Mixed forest land	5	Forest land
51	Streams and canals	4	Water
52	Lakes	4	Water
53	Reservoirs	4	Water
54	Bays and estuaries	4	Water
61	Forested wetland	5	Forest land
62	Non-forest wetland	6	Wetland

**Table 2, Continued.**

**Regrouping of LULC Categories for ILLR Applications**

LULC Classification Number	LULC Classification Description	ILLR Clutter Category Number	ILLR Clutter Category Description
71	Dry salt flats	1	Open land
72	Beaches	1	Open land
73	Sandy areas other than beaches	1	Open land
74	Bare exposed rock	1	Open land
75	Strip mines, quarries, and gravel pits	1	Open land
76	Transitional areas	1	Open land
77	Mixed barren land	1	Open land
81	Shrub and brush tundra	1	Open land
82	Herbaceous tundra	1	Open land
83	Bare ground	1	Open land
84	Wet tundra	1	Open land
85	Mixed tundra	1	Open land
91	Perennial snowfields	10	Snow & ice
92	Glaciers	10	Snow & ice

**Table 3.****Clutter Loss as a Function of ILLR LULC Clutter Category and TV Channel**

Clutter loss values in this table have been estimated based on the test data published by Thomas N. Rubinstein, "Clutter Losses and Environmental Noise Characteristics Associated with Various LULC Categories," *IEEE Transactions on Broadcasting*, Vol. 44, No. 3, September 1998. Values for low band VHF have been added by extrapolation from higher frequencies using frequency trends developed by Okumura, Yoshihisa *et al*, "Field Strength and its Variability in VHF and UHF Land Mobile Radio Service," *Rev. Electrical Comm Lab*, Vol. 16, Sept-Oct 1968, pp 825-873.

ILLR Clutter Category Number	ILLR Clutter Category Description	<b>Clutter Loss</b>			
		dB to be added to Longley-Rice prediction of path loss provided the path profile shows 0.6 Fresnel clearance			
		Low Band VHF, Channels 2-5	High Band VHF, Channels 7-13	UHF Band	
				Channels 14-36	Channels 38-69
1	Open Land	6	7	12	16
2	Agricultural	7	8	14	18
3	Rangeland	7	9	10	19
4	Water	0	0	0	0
5	Forest Land	7	8	16	25
6	Wetland	0	0	0	0
7	Residential	10	12	16	21
8	Mixed Urban/Buildings	10	15	17	18
9	Commercial/Industrial	10	15	15	17
10	Snow and Ice	0	0	0	0

## **APPENDIX B**

### **Proposed Amendments to the Rules**

Part 73 of Chapter I of title 47 of the Code of Federal Regulations is amended as follows:

#### **PART 73 – RADIO BROADCAST SERVICES**

1. The authority citation for Part 73 continues to read as follows:

Authority: 47 U.S.C. 154, 303, 334, and 336.

2. The title of Section 73.683 is amended to read as follows:

Section 73.683 Field Strength Contours and Presumptive Determination of Field Strength at Individual Locations.

3. A new subsection 73.683(d) is added as follows:

(d) Field strength shall be determined by the Individual Location Longley-Rice (ILLR) propagation prediction model for purposes of determining the eligibility of individual households for satellite retransmission of distant network signals under the copyright law provisions of 17 U.S.C. §119(d)(10)(A). Guidance for use of the ILLR model for these purposes is provided in OET Bulletin No. 70.